

### **3.0 THRESHOLD DETERMINATIONS**

This section reviews how accurately facilities determined whether Section 313 chemicals exceeded TRI reporting thresholds. Errors in threshold determinations can cause facilities to submit Form Rs for chemicals that do not exceed applicable reporting thresholds and also can cause facilities to fail to submit Form Rs for chemicals that exceed these thresholds. These two scenarios may lead facilities to understate or overstate emissions reported to the TRI database, respectively. Using the following topics, this section discusses the extent to which erroneous threshold determinations impact the quality of TRI data:

- Approaches commonly used to calculate thresholds
- Errors made when calculating thresholds
- Reasons for making erroneous threshold determinations

The section concludes with a review of key findings and offers several recommendations to help facilities improve reporting practices in the future.

It should be noted that this section does not differentiate facilities that submitted Form As from those that submitted Form Rs. Because the magnitude of the total annual reportable amount (the sum of Sections 8.1 - 8.7 on the Form R) ultimately determines when facilities can use Form As, Sections 5 and 6 of this report provide specific details on the frequency with which facilities use short reporting forms.

#### **3.1 Approaches Used for Determining Thresholds**

The following discussion considers how the approaches that facilities use to calculate thresholds affect the quality of TRI data. Although the TRI reporting instructions include specific criteria for determining when chemicals exceed reporting thresholds, the instructions do not require facilities to use specific approaches for conducting threshold determinations. Accordingly, facilities use many different approaches to determine whether Section 313 chemicals exceed activity thresholds. The most appropriate approach depends largely

on information available to the facility and specific uses of a chemical. For example, purchasing and inventory data may be the best data source for evaluating thresholds for certain raw materials, while process recipes or production data may be more appropriate data sources for evaluating thresholds for products. During each site audit, surveyors identified approaches used for determining thresholds from information available in the facility's supporting documentation. In cases where facilities did not estimate thresholds, site surveyors identified an approach that could reasonably have been used to estimate thresholds.

Figures 3-1, 3-2, and 3-3 summarize the approaches most commonly used by facilities (or that could reasonably have been used by facilities) to estimate thresholds for TRI reporting years 1987, 1994, and 1995, respectively. The quantitative data for RY 1988 were not available. For quick reference, Table 3-1 presents the same data for all reporting years considered. This table and these figures illustrate several trends:

- For RY 1987, 1994, and 1995, and for all industries considered, facilities primarily used purchasing data to determine whether chemicals exceeded appropriate thresholds. By this approach, facilities typically determine annual usage by calculating total purchases during a calendar year and correcting these quantities for changing levels of inventory. For reference, Appendix D includes an example threshold calculation using this approach.
- Facilities in the inorganic and organic chemical manufacturing industries (SIC Codes 281 and 286) use production data to calculate thresholds more frequently than facilities in other industries. These industries typically use production data to determine thresholds for Section 313 chemicals that are produced on-site by chemical reactions. Facilities in the furniture (25), paper (26), paint (285), and plastics (30) manufacturing industries generally do not have reactions that produce large quantities of Section 313 chemicals and therefore rarely use production data to calculate thresholds.
- Facilities in the inorganic and organic chemical manufacturing industries also are more likely to assume that chemical usage exceeds reporting thresholds, rather than calculate annual usage directly. Making such assumptions is only advised in cases where facilities clearly produce or consume extremely large quantities of Section 313 chemicals, a scenario common to large chemical manufacturing plants. As noted in Section

**Table 3-1**

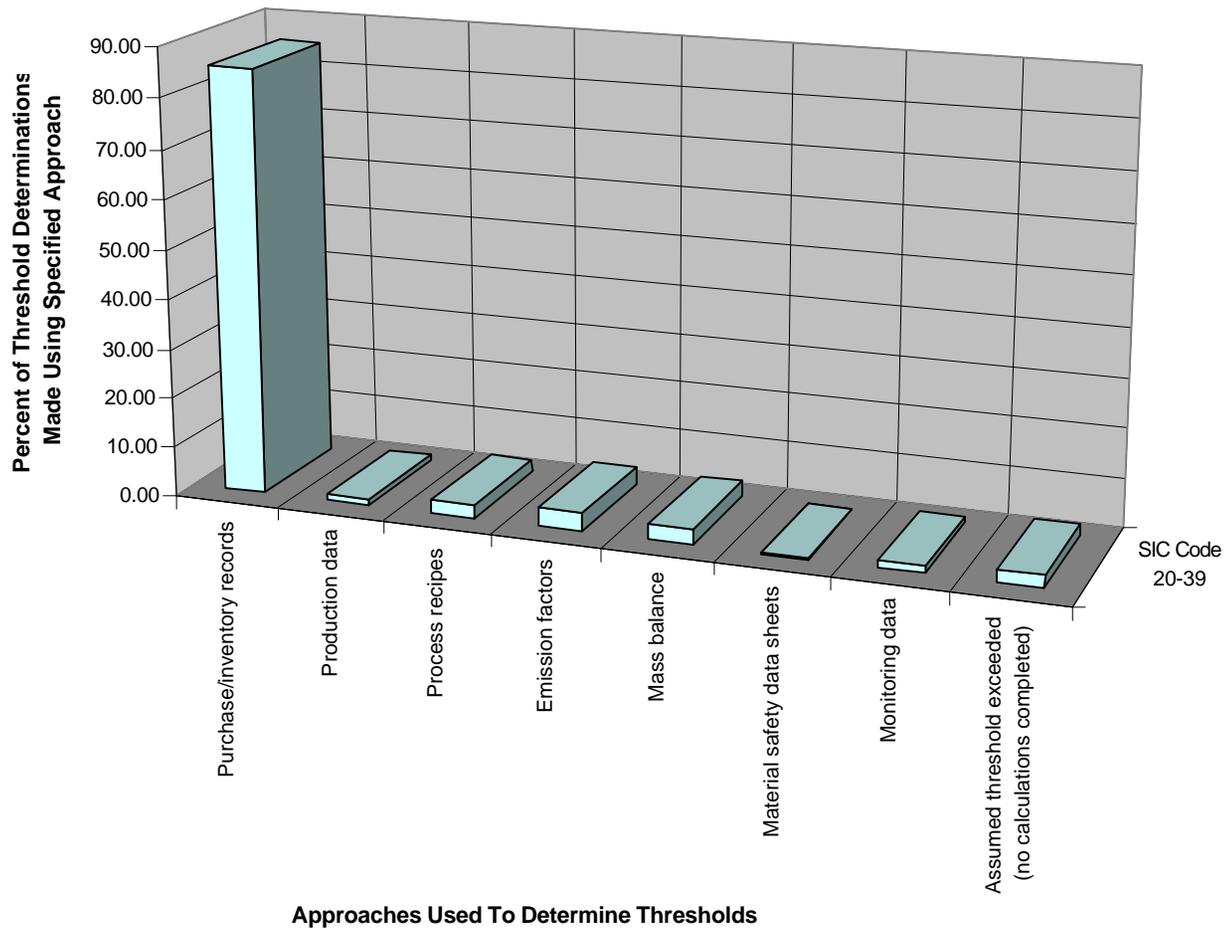
**Approaches Used by Facilities to Make Threshold Determinations**

Approach Used to Make Threshold Determination	Percent of Facilities Using Specific Approach for Threshold Determinations						
	RY 1987	RY 1994				RY 1995	
	SIC Code 20-39	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Purchase/Inventory records	85	96	87	96	93	100	90
Production data	1	0	49	12	15	0	70
Process recipes	3	16	16	4	15	0	50
Emission factors <sup>a</sup>	4	0	0	0	6	50	10
Mass balance	3	4	9	0	0	20	20
Material safety data sheets	0	1	13	23	4	0	0
Monitoring data	1	0	8	0	0	30	10
Assumed threshold exceeded (no calculations completed)	2	4	63	8	0	10	20
Other approach	0	12	4	1	0	10	20

Note: Because some facilities used multiple approaches to calculate thresholds for a given chemical, the sum of the percents for a given SIC Code may exceed 100.

<sup>a</sup> "Emission Factors" in this table refers to any factors supplied by EPA or a trade association which are technically supported and used to determine the amount of any given chemical manufactured, processed, or otherwise used at the facility.

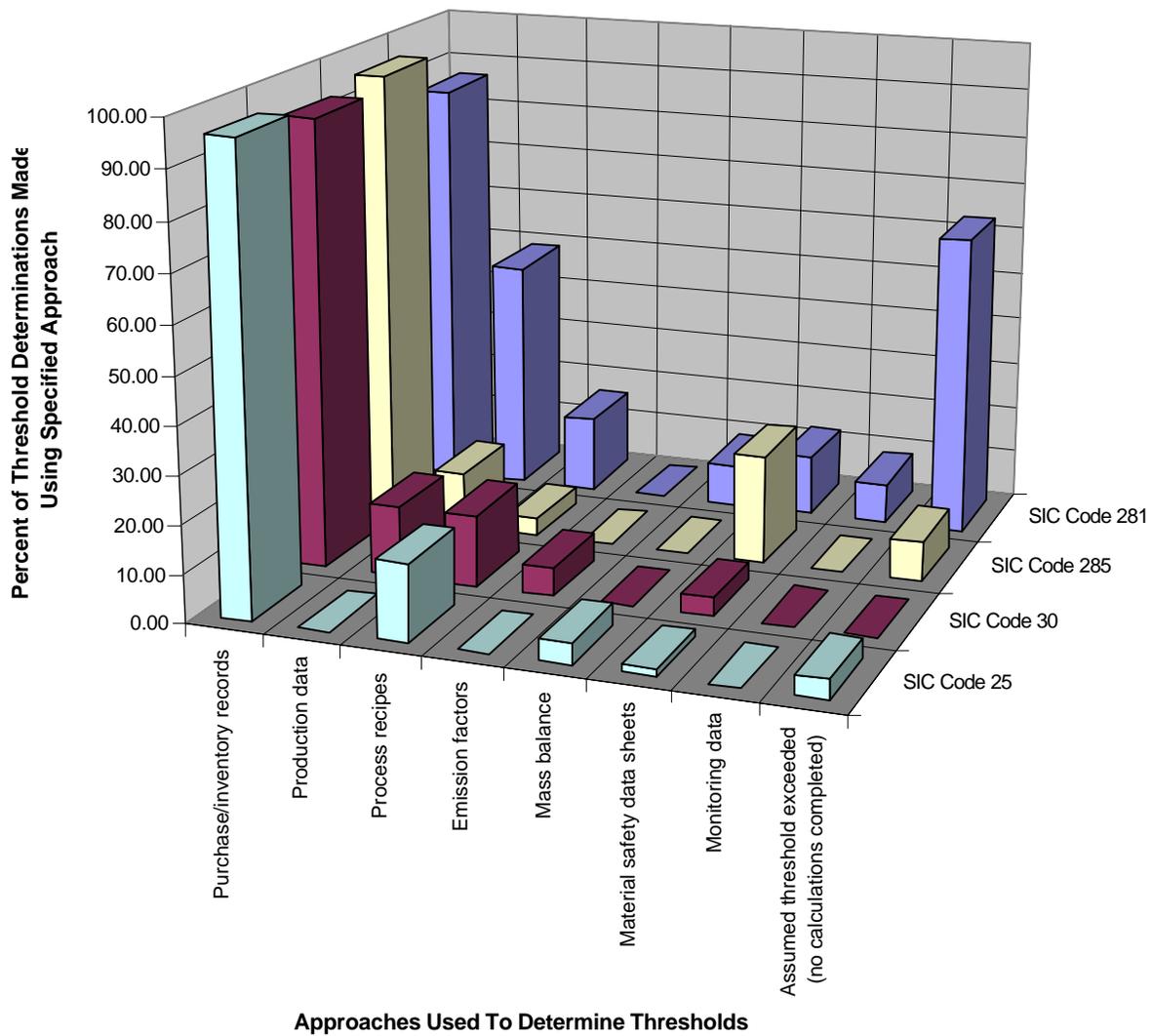
**Figure 3-1. Approaches Used By Facilities To Make Threshold Determinations for RY 1987**



3-4

Data for this figure can be found on Table 3-1

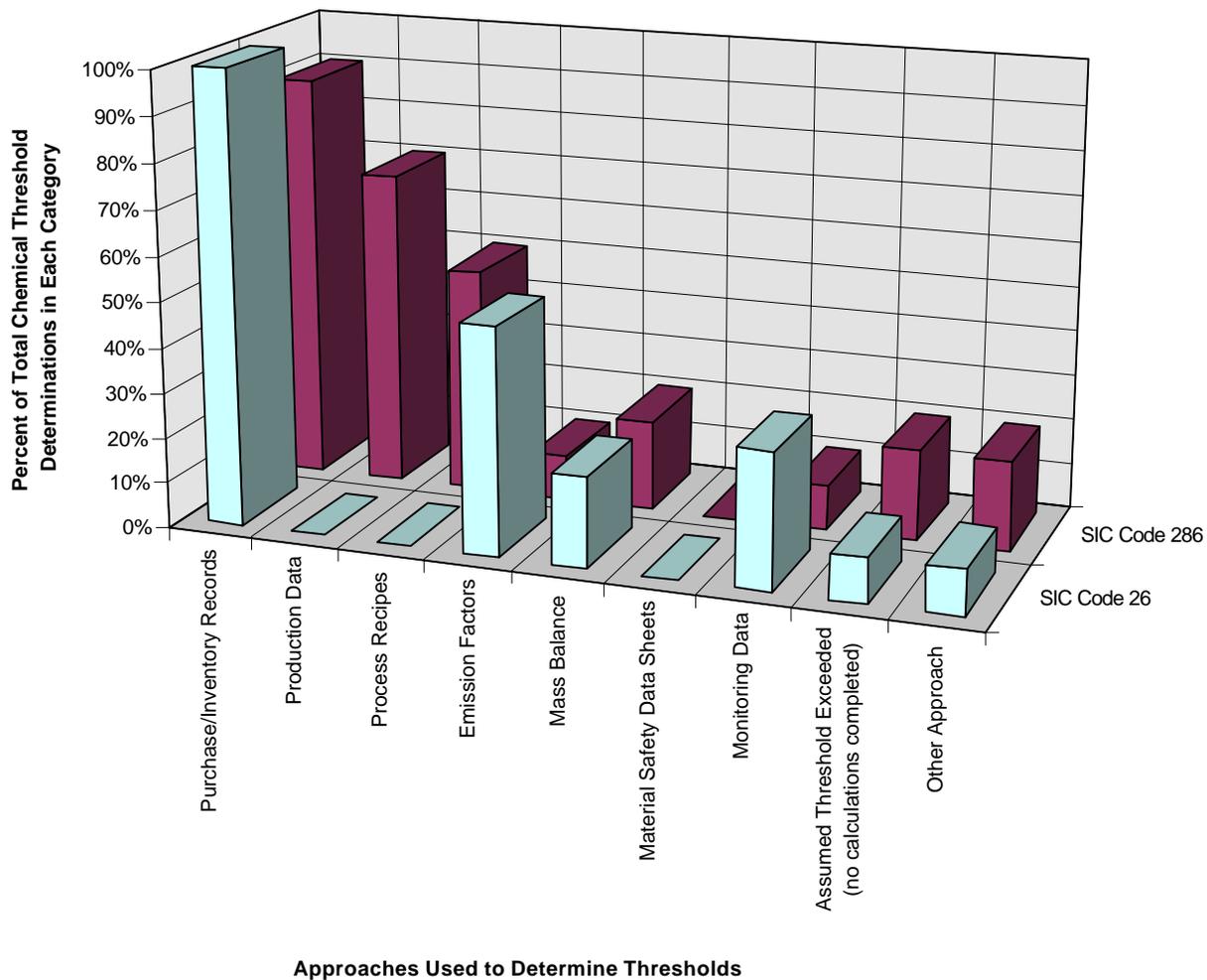
**Figure 3-2. Approaches Used By Facilities To Make Threshold Determinations for RY 1994**



3-5

Data for this figure can be found on Table 3-1

**Figure 3-3. Approaches Used by Facilities to Make Threshold Determinations for RY 1995**



9-8

Data for this figure can be found on Table 3-1.

3.3.4, however, facilities that assume thresholds are exceeded tend to make more errors in threshold determinations than facilities that calculate actual quantities manufactured, processed or otherwise used.

To evaluate how approaches for determining thresholds might affect the quality of TRI data, the remainder of this section considers how these approaches may have caused facilities to make incorrect threshold determinations.

### **3.2 Frequency of Errors Made When Determining Thresholds**

The following analyses indicate the frequency and type of errors made by facilities when determining thresholds and comment on how these errors may affect the overall quality of TRI data. During site visits, surveyors used information provided by facility contacts to calculate thresholds for Section 313 chemicals. For reference, Attachment F includes several examples of how site surveyors calculated thresholds. Based on these threshold calculations, surveyors then listed chemicals for which facilities should have submitted Form Rs. Errors in threshold determinations were identified by comparing lists of chemicals that exceeded thresholds, as determined by the site surveyor, to chemicals for which facilities submitted Form R reports. These comparisons yielded four possible outcomes:

- The facility submitted a Form R for a chemical that exceeded a threshold.
- The facility did not submit a Form R for a chemical that did not exceed a threshold.
- The facility submitted a Form R for a chemical that did not exceed a threshold.
- The facility did not submit a Form R for a chemical that exceeded a threshold.

The first two outcomes represent cases where facilities correctly determined thresholds, while the last two outcomes represent two general types of errors made when calculating thresholds. The last two errors can cause facilities to overstate or understate, respectively, the releases and other quantities managed as waste reported to TRI. Using these

outcomes, Figure 3-4 and Table 3-2 summarize the frequency of errors that facilities made when determining thresholds during reporting years 1987, 1988, 1994, and 1995. As a summary, Figures 3-5 and 3-6 indicate the frequency with which facilities made correct and incorrect threshold determinations. Several important observations can be made from these data:

- Over all industries and reporting years considered, Figures 3-5 and 3-6 indicate that facilities consistently determined thresholds correctly for over 90 percent of the Section 313 chemicals used at their respective plants. The errors made when determining thresholds were almost evenly split between failing to submit Form-Rs for chemicals that exceeded thresholds and submitting Form Rs for chemicals that did not exceed thresholds.
- For roughly 5 percent of the Section 313 chemicals used in the industries considered, facilities submitted Form Rs when thresholds were not exceeded. Facilities in the inorganic and organic chemical manufacturing industries (SIC Codes 281 and 286) made this error more frequently than facilities in other industries. The errors made by inorganic and organic chemical manufacturers may be caused by these facilities assuming that thresholds were exceeded (see Figures 3-2 and 3-3) rather than actually calculating annual quantities manufactured, processed or otherwise used. Section 3.3 provides additional insight into the sources of these errors.
- Also for roughly 5 percent of the Section 313 chemicals used in the industries considered, facilities failed to submit Form Rs when thresholds were exceeded. Again, this tendency was greatest for facilities in the inorganic chemical manufacturing industry (SIC Code 281). Section 3.3 examines the sources of these errors in greater detail.

In summary, the frequency of errors suggest that industries incorrectly compute thresholds for between 5 and 10 percent of the Section 313 chemicals used at their corresponding facilities. These errors included a nearly even number of cases in which facilities submitted Form Rs for chemicals that did not exceed thresholds as cases in which facilities did not submit Form Rs for chemicals that exceeded thresholds.

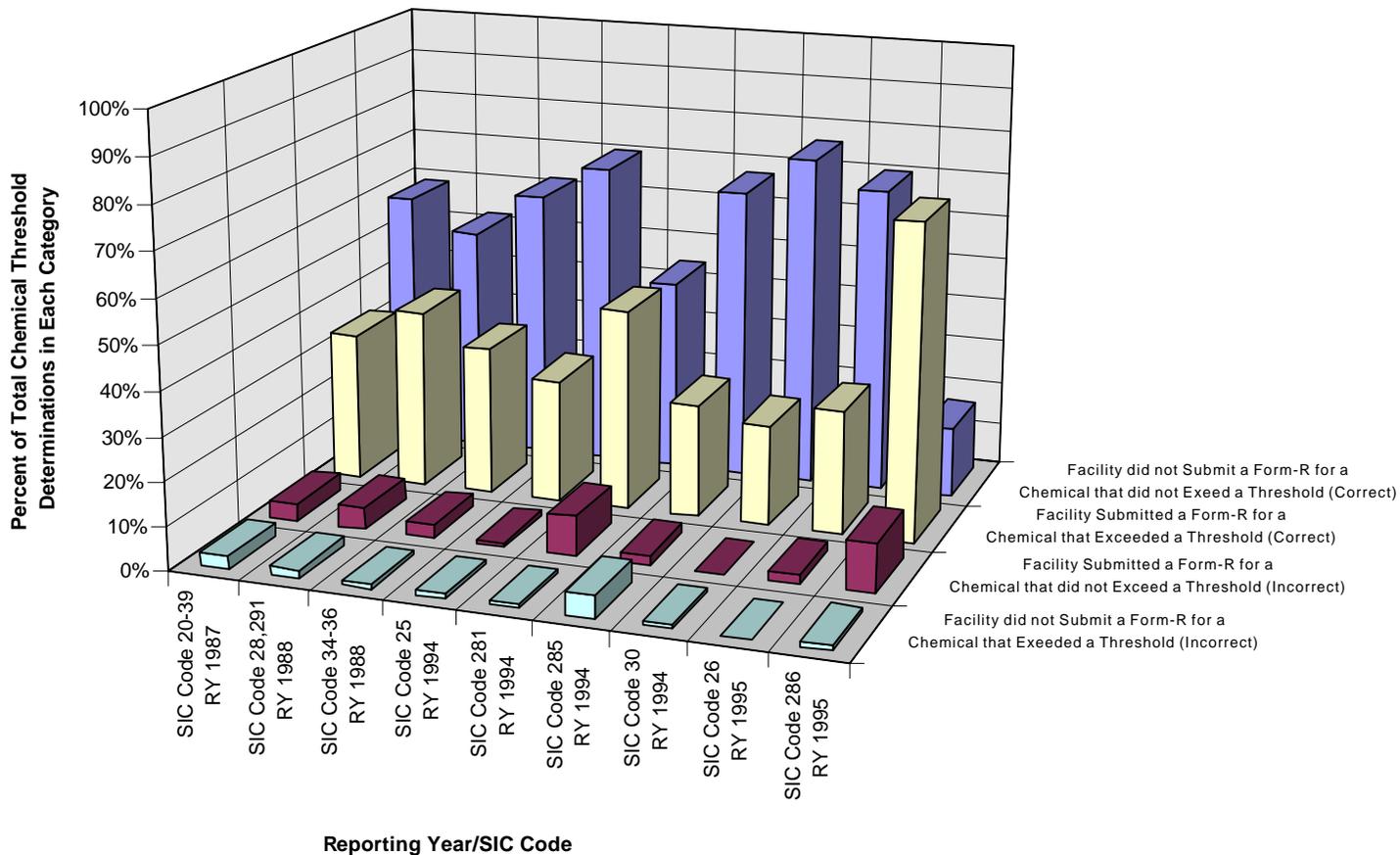
**Table 3-2**

**Accuracy of Threshold Determinations by Reporting Year and SIC Code**

Outcome	Percent of Section 313 Chemicals Broken Down by Threshold Determination Outcome								
	RY 1987	RY 1988		RY 1994				RY 1995	
	SIC Code 20-39	SIC Code 28, 291	SIC Code 34-36	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Facility did not submit a Form R for a chemical that did not exceed a threshold	59	52	62	70	41	66	76	70	16
Facility submitted a Form R for a chemical that exceeded a threshold	34	41	34	28	43	26	23	28	72
Facility did not submit a Form R for a chemical that exceeded a threshold	3	2	1	1	8	5	2	0	1
Facility submitted a Form R for a chemical that did not exceed a threshold	4	5	3	1	8	2	0	2	11

Note: The first two outcomes represent cases where facilities correctly determined thresholds, while the last two outcomes represent cases where facilities incorrectly determined thresholds. Figure 3-5 compares the correct and incorrect threshold determinations by reporting year and SIC Code.

**Figure 3-4. Accuracy of Threshold Determinations by Reporting Year and SIC Code**



Note: The first two outcomes represent cases where facilities incorrectly determined thresholds, while the last two outcomes represent cases where facilities correctly determined thresholds. Figure 3-5 compares the correct and incorrect threshold determinations by reporting year and SIC Code.

Data for this figure can be found on Table 3-2.

Figure 3-5. Accuracy of Threshold Determinations by Reporting Year and SIC Code for RY 1987 and RY 1988

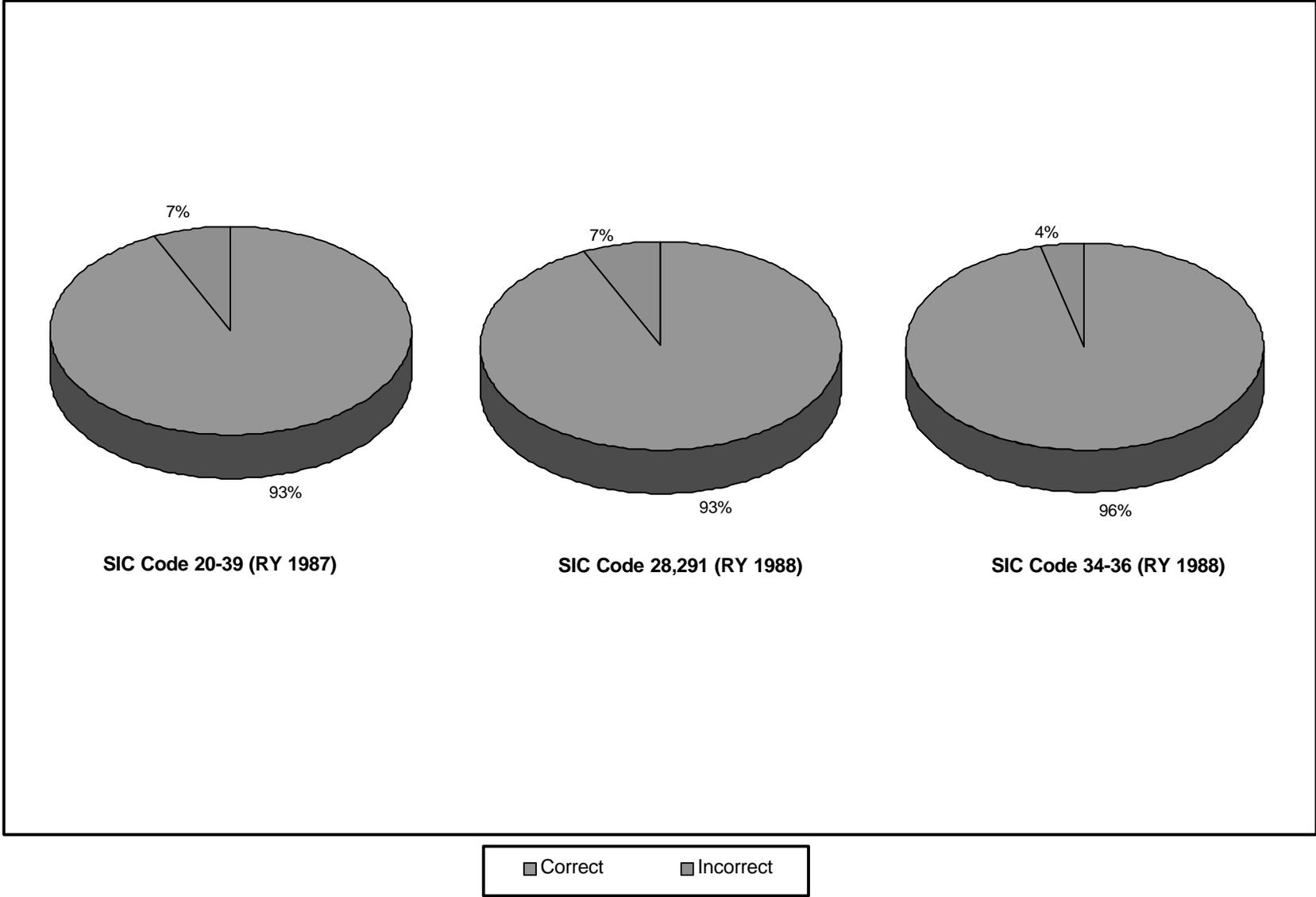
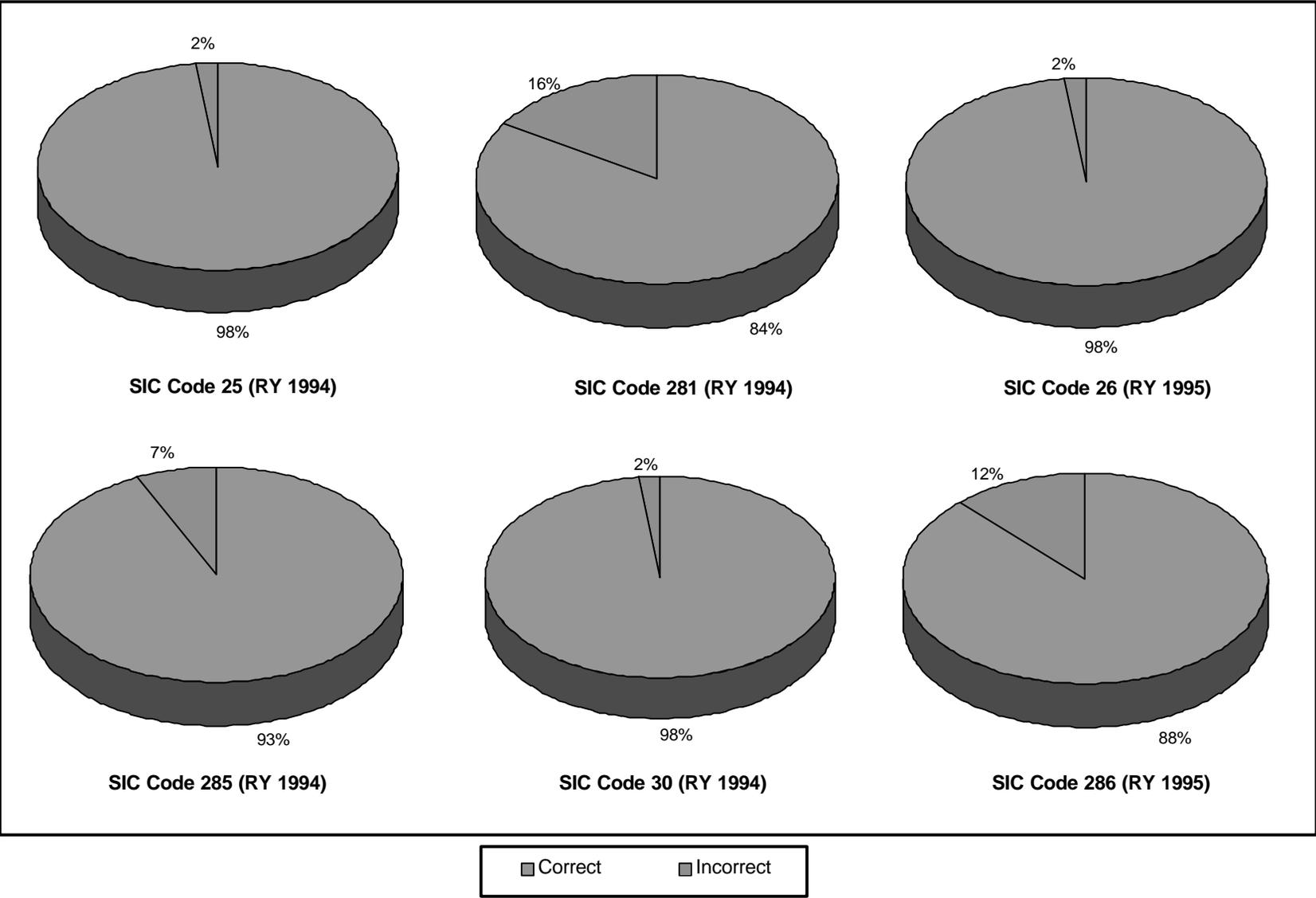


Figure 3-6. Accuracy of Threshold Determinations by Reporting Year and SIC Code for RY 1994 and RY 1995



### **3.3 Sources of Errors Made When Determining Thresholds**

This section summarizes reasons why facilities made errors when determining thresholds. During site visits, surveyors identified these reasons from discussions with facility contacts and from data in the facility's supporting documentation. The following subsections examine the sources of errors from the most recent round of site surveys. To help industrial facilities minimize errors made in threshold determinations, Section 3.4 offers several recommendations for avoiding such errors in future reporting years.

#### **3.3.1 Reasons Why Facilities Failed to Submit Form Rs for Chemicals That Exceeded Thresholds**

Table 3-3 summarizes reasons why facilities failed to submit Form Rs for chemicals that exceeded thresholds during TRI reporting years 1994 and 1995. The data are not classified by SIC Code, because not enough errors were observed for these reporting years to make statistically significant conclusions for each industry. Further, the data are not compared to those for previous reporting years, because the previous studies used slightly different sets of categories to classify errors. As shown in the table, the most common reasons why facilities did not identify chemicals used at reportable levels was because facilities either overlooked the use of Section 313 chemicals or facilities miscalculated annual thresholds. These general reasons include a wide range of different errors, including cases where facilities assumed thresholds were not exceeded, cases where facilities were unaware that chemicals could have exceeded reportable quantities, and cases where facilities miscalculated total usage. The following lists indicate specific examples of errors documented during site visits:

##### *Overlooking a chemical activity:*

- For each TRI reporting year, a consultant for a plastic manufacturer prepared Form Rs for the same set of chemicals, without first calculating thresholds for all Section 313 chemicals used at the facility. The consultant failed to notice that toluene should have been reported in 1995 due to increased use of certain solvents.

**Table 3-3**

**Reasons Why Facilities Failed to Submit Form Rs  
for Chemicals That Exceeded Thresholds**

<b>Reason for not submitting a Form R for chemicals that exceeded thresholds</b>	<b>RY 1994</b>		<b>RY 1995</b>	
	<b>Number of Observations</b>	<b>Percent of Total Errors</b>	<b>Number of Observations</b>	<b>Percent of Total Errors</b>
Chemical activity was overlooked	9	53	1	100
Chemical activity was misclassified	0	0	0	0
Threshold quantity was miscalculated	7	39	0	0
Chemical was incorrectly reported as a chemical category	1	6	0	0

Note: Due to the limited number of errors identified during the site visits, the percents listed in this table may not necessarily represent the actual distribution of reasons why facilities make errors on their Form Rs.

- A paint manufacturer did not examine the Material Safety Data Sheet (MSDS) for “commercial grade” xylene, which indicated that the mixture contained 15 percent ethylbenzene. Although the facility correctly reported for xylene, the facility failed to report for ethylbenzene.
- A furniture manufacturer failed to notice that a pigment used to coat metal products contained several metal compounds on the TRI reporting list. The MSDS for this pigment and the annual usage of the pigments suggest that the facility should have reported for the metal compounds.
- A paint manufacturer used a solvent containing glycol ethers to thin several paint products but assumed that the limited usage could not possibly have exceeded threshold quantities. Review of purchasing data indicated that total annual usage was significantly greater than threshold amounts.
- A chemical manufacturer correctly reported for all Section 313 chemicals that were in reactants and products but did not consider Section 313 chemicals that were components of wastewater treatment mixtures and catalysts. The site surveyor noted that some of these chemicals that were not used directly for production exceeded reporting thresholds.

*Miscalculating a threshold:*

- A furniture manufacturer did not report for xylene (mixed isomers), but made several calculation errors when determining annual quantities otherwise used from individual purchasing invoices. The site surveyor loaded the purchasing data into a spreadsheet and calculated an annual quantity otherwise used exceeding corresponding threshold quantities.
- A chemical manufacturer used the lower bound of a concentration range to make a threshold determination for a Section 313 chemical. Using the midpoint of the concentration range (as required by the TRI reporting instructions), the site surveyor found the chemical exceeded threshold amounts.

### **3.3.2 Reasons Why Facilities Submitted Form Rs for Chemicals That Did Not Exceed Thresholds**

Table 3-4 summarizes why facilities submitted Form Rs for chemicals that did not exceed thresholds during TRI reporting years 1994 and 1995. For the same reasons as given in the previous section, the data are not classified by SIC Code and are not compared to previous

**Table 3-4**

**Reasons Why Facilities Submitted Form Rs  
for Chemicals That Did Not Exceed Thresholds**

<b>Reason for submitting a Form R for chemicals that did not exceed thresholds</b>	<b>RY 1994</b>		<b>RY 1995</b>	
	<b>Number of Observations</b>	<b>Percent of Total Errors</b>	<b>Number of Observations</b>	<b>Percent of Total Errors</b>
Facility reported despite noting that threshold was not exceeded	4	18	2	14
Facility assumed threshold was exceeded	2	9	3	21
Chemical activity was misclassified	1	5	2	14
Threshold quantity was miscalculated	2	9	2	14
Chemical was exempt	0	0	1	7
Facility misinterpreted revised reporting guidelines	11	50	3	21
Other	2	9	1	7

Note: Due to the limited number of errors identified during the site visits, the percents listed in this table may not necessarily represent the actual distribution of reasons why facilities make errors on their Form Rs.

reporting years. As shown in the table, approximately two thirds of the incorrectly submitted Form Rs resulted from facilities misinterpreting revised reporting threshold guidance or from facilities submitting Form Rs despite calculating annual usages below threshold quantities. The following list describes specific instances when site surveyors classified threshold determination errors in these two categories.

*Facility misinterpreted revised reporting guidelines:*

- A paint manufacturing facility submitted a Form R for acetone in reporting year 1994 even though EPA removed acetone from the list of reportable chemicals. The site surveyor noted that acetone was delisted and that the form should be withdrawn.
- A paper manufacturing facility used aqueous ammonia in several process areas but did not account for the revised reporting guidance indicating that only 10 percent of aqueous ammonia should be counted towards threshold determinations. Using this guidance, the site surveyor determined that the quantities of ammonia used did not exceed reporting thresholds. For reference, Appendix F includes a specific example of computing thresholds for aqueous ammonia solutions.
- A chemical manufacturing facility submitted a Form R for aqueous sulfuric acid used to neutralize wastewater, without considering the sulfuric acid activity qualifier for “acid aerosols.” The site surveyor noted that insignificant quantities of the sulfuric acid existed as aerosols and concluded that the chemical should not have been reported.

*Facility reported for the chemical, despite calculating a manufacture, process, or otherwise use quantity below threshold quantities:*

- An organic chemical manufacturing facility submitted a Form R for xylene in every reporting year since 1987. In reporting year 1995, however, the facility noted that usage of xylene was below the corresponding thresholds. Fearing that not submitting a Form R for a chemical that was previously reported might somehow trigger an audit or enforcement response, the facility reported for xylene anyway.
- A paper manufacturing facility correctly determined that 9,700 pounds of chlorine were “otherwise used” during reporting year 1995. The facility submitted a Form R for chlorine anyway, noting that it would be better to report a chemical that may not have exceeded a threshold than to not report a chemical that exceeded a threshold.

### 3.3.3 Chemical Activity Classification

Because appropriate TRI reporting thresholds (i.e., 10,000 or 25,000 pounds) depend on how facilities use Section 313 chemicals, it is important that facilities correctly classify chemical activities as either “manufacture,” “process,” or “otherwise use.” For instance, Table 3-4 indicates that several facilities submitted Form Rs for chemicals that did not exceed thresholds due to incorrect chemical activity classifications. To evaluate how accurately facilities classify chemicals, site surveyors documented during each site visit activities for all Section 313 chemicals based on information provided by facility contacts and on observations made during facility tours. Table 3-5 compares chemical activity classifications made by facilities to those made by site surveyors for reporting years 1994 and 1995, respectively; Figure 3-7 also displays this data but in bar chart format. Similar data are not available for previous reporting years. Based on these data, site surveyors note that:

- Facilities in all industries made errors when classifying chemical activities, with rubber and plastic manufacturers (SIC Code 30) making the fewest and paint manufacturers (SIC Code 285) making the most.
- Of the three chemical activities, facilities made most errors determining whether chemicals were “processed” or “otherwise used.” These particular errors resulted to a great extent from facilities misclassifying chemical activities for solvents. Part of this confusion may originate from text in the TRI Reporting Instructions handbook which correctly lists solvents as an example of a formulation component (under “processed”) as well as an example of a chemical processing aid (under “otherwise used”). Some facilities did not understand the distinction between these two activities.
- Some classification errors resulted from facilities being unaware that a chemical with multiple uses could be classified under more than one chemical activity.

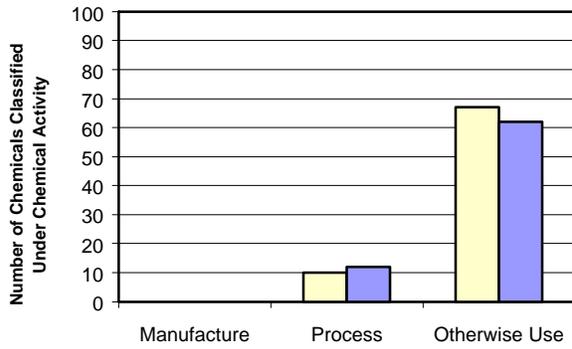
**Table 3-5**

**Comparison of Chemical Activity Classifications Made by Reviewers to Those Made by Facilities,  
by Reporting Year and SIC Code**

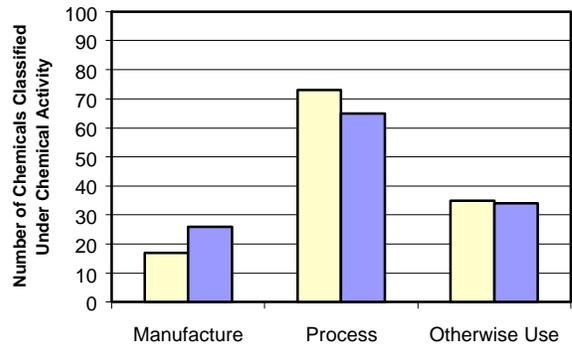
Chemical Activity	Number of Chemicals Used at Selected Facilities, Classified by Activity											
	Reporting Year 1994								Reporting Year 1995			
	SIC Code 25		SIC Code 281		SIC Code 285		SIC Code 30		SIC Code 26		SIC Code 286	
	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer
Manufacture	0	0	26	17	1	0	0	0	56	64	77	56
Process	12	10	65	73	67	83	30	31	4	3	46	58
Otherwise Use	62	67	34	35	15	25	26	26	37	29	26	29

Note: Reviewers and facilities may have classified selected Section 313 chemicals under multiple chemical activity categories. Therefore, the total number of chemicals classified under “facility” for a given SIC Code does not necessarily equal the total classified under “reviewer.”

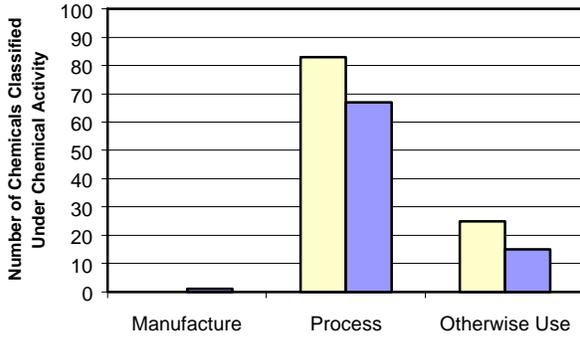
**Figure 3-7. Comparison of Chemical Activity Classifications made by Facilities to those made by Reviewers**



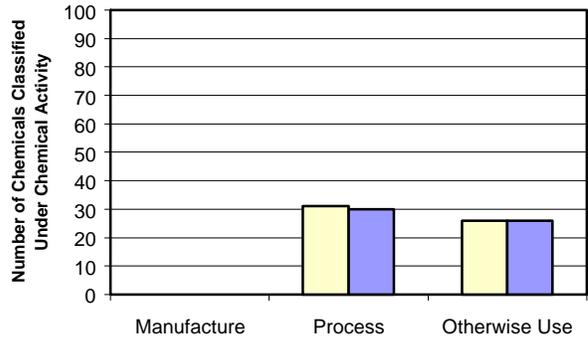
**SIC Code 25 (RY 1994)**



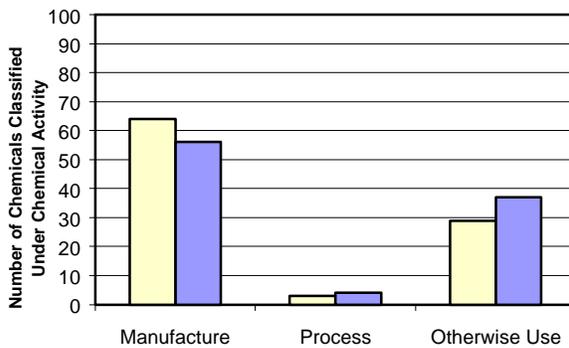
**SIC Code 281 (RY 1994)**



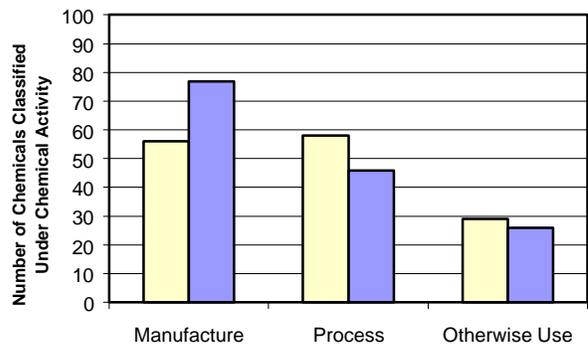
**SIC Code 285 (RY 1994)**



**SIC Code 30 (RY 1994)**



**SIC Code 26 (RY 1995)**



**SIC Code 286 (RY 1995)**



Data for this figure can be found on Table 3-5.

Although misclassified chemical activities account for only a small fraction of errors in threshold determinations (see Table 3-3 and 3-4), EPA can help minimize these errors in future reporting years by informing facilities of common mistakes and of correct classifications for chemicals that are frequently misclassified, such as solvents.

### **3.3.4 Impact of Not Calculating Thresholds**

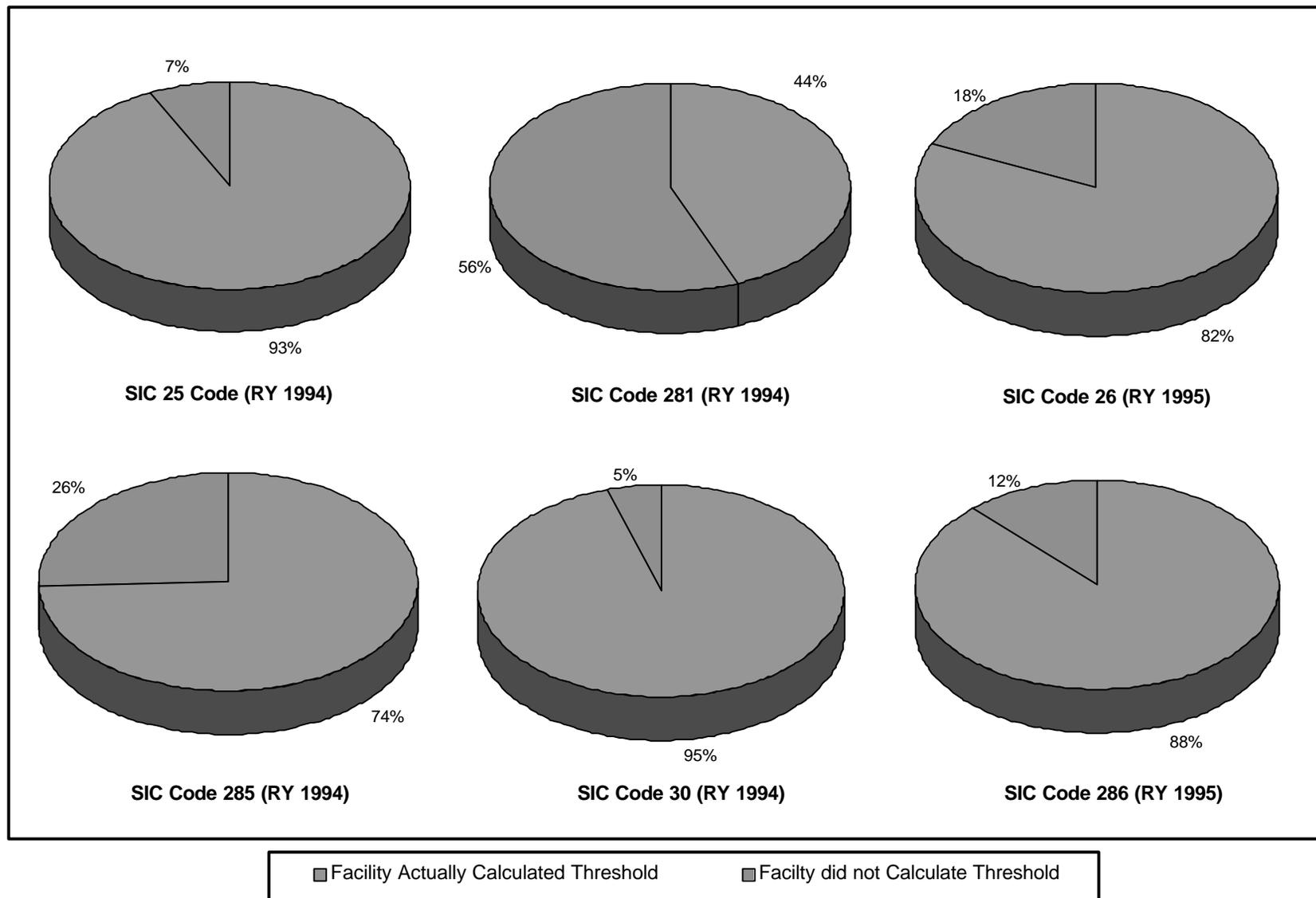
An important factor to consider in the accuracy of threshold determinations is whether facilities actually calculated threshold levels for Section 313 chemicals or assumed that thresholds were, or were not, exceeded. At each facility visited, site surveyors used feedback from facility contacts and data in supporting documentation to determine which method was adopted to make threshold determinations. For Section 313 chemicals found to exceed reporting thresholds, Figure 3-8 summarizes the frequency with which facilities in the selected industries actually calculated annual usages. The data in Figure 3-8 may, at first, seem to contradict the data in Table 3-1 (approaches used for determining thresholds). The reader should note, however, that Table 3-1 indicated approaches that facilities actually used to determine thresholds for each chemical reported. Figure 3-8 counts thresholds calculated at least once (for any chemical) at a given facility.

Not surprisingly, facilities in the industries that calculated thresholds most often (SIC Code 25 and SIC Code 30) made fewer errors when determining thresholds than facilities in the industries that calculated thresholds less frequently (SIC Code 281 and SIC Code 285). This observation suggests that errors in threshold determinations may be significantly reduced if facilities actually calculate annual usages for Section 313 chemicals, as opposed to assuming that chemicals are below or above reporting thresholds.

## **3.4 Lessons Learned**

In summary, site surveyors found that facilities in the furniture, rubber, paper, and plastic manufacturing industries (SIC Codes 25, 26, and 30) determined thresholds more accurately than facilities in the inorganic, paint, and organic chemical manufacturing industries

**Figure 3-8. Frequency with which Facilities Calculated Thresholds for EPCRA Section 313 Chemicals**



(SIC Codes 281, 285, and 286). Further, facilities as a whole correctly calculated thresholds for over 90 percent of the Section 313 chemicals used at the selected industries. For nearly 5 percent of the Section 313 chemicals, however, facilities failed to submit Form Rs in cases where thresholds were exceeded; and, for the remaining 5 percent of chemicals, facilities submitted Form Rs when quantities manufactured, processed or otherwise used did not exceed thresholds. Therefore, according to the most recent site surveys, a small fraction of the Form Rs currently logged in the TRI database need not have been filed, but facilities failed to submit a nearly equal amount of Form Rs for chemicals that exceeded threshold levels. Although this observation may suggest that the total number of Form Rs in the TRI database is highly representative of the actual amount of Section 313 chemicals that exceed thresholds, it must be noted that the site survey data may be influenced by limitations posed by sample selection (see Section 2.2).